

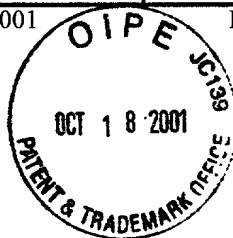


## UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING/RECEIPT DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NUMBER
09/894,903	06/29/2001	Hong Bae Park	041501-5437

009629  
MORGAN, LEWIS & BOCKIUS  
1800 M STREET NW  
WASHINGTON, DC 20036-5869



CONFIRMATION NO. 4657

## FORMALITIES LETTER



\*OC00000006454714\*

Date Mailed: 08/21/2001

## NOTICE TO FILE MISSING PARTS OF NONPROVISIONAL APPLICATION

FILED UNDER 37 CFR 1.53(b)

*Filing Date Granted*

An application number and filing date have been accorded to this application. The item(s) indicated below, however, are missing. Applicant is given **TWO MONTHS** from the date of this Notice within which to file all required items and pay any fees required below to avoid abandonment. Extensions of time may be obtained by filing a petition accompanied by the extension fee under the provisions of 37 CFR 1.136(a).

- The statutory basic filing fee is missing.  
*Applicant must submit \$ 710 to complete the basic filing fee and/or file a small entity statement claiming such status (37 CFR 1.27).*
- The oath or declaration is missing.  
*A properly signed oath or declaration in compliance with 37 CFR 1.63, identifying the application by the above Application Number and Filing Date, is required.*
- To avoid abandonment, a late filing fee or oath or declaration surcharge as set forth in 37 CFR 1.16(e) of \$130 for a non-small entity, must be submitted with the missing items identified in this letter.
- **The balance due by applicant is \$ 840.**

The application is informal since it does not comply with the regulations for the reason(s) indicated below.

The required item(s) identified below must be timely submitted to avoid abandonment:

- A substitute specification in compliance with 37 CFR 1.52 because:
  - Papers contain improper margins. *Each sheet must have a left margin of at least 2.5 cm (1") and top, bottom and right margins of at least 2.0 cm (3/4")*

10/19/2001 HVUONG1 00000064 09894903

01 FC:101	740.00 OP
02 FC:105	130.00 OP

*A copy of this notice **MUST** be returned with the reply.*

Initial Patent Examination Division (703) 308-1202

PART 2 - COPY TO BE RETURNED WITH RESPONSE

[illegible]



Sector ✓

PATENT  
ATTORNEY DOCKET NO.: 041501-5437

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of: )  
)  
Hong Bae PARK )  
)  
Application No.: 09/894,903 ) Group Art Unit: 2879  
)  
Filed: June 29, 2001 ) Examiner: Unassigned  
)  
For: FLAT LUMINESCENT LAMP AND )  
METHOD FOR MANUFACTURING THE )  
SAME )

Commissioner for Patents  
**BOX MISSING PARTS**  
Washington, D.C. 20231

**RESPONSE TO NOTICE TO FILE MISSING PARTS**

1. This replies to the Notice to File Missing Parts of Nonprovisional Application mailed August 21, 2001.

A copy of the Notice To File Missing Parts Of Nonprovisional Application is enclosed.

2. Declaration Or Oath

- ☒ No declaration or oath was filed. Enclosed is the original Combined Declaration and Power of Attorney
- ☐ The specification attached to the declaration is a copy of the specification and any amendments thereto which were filed in the PTO to obtain the filing date.
- ☐ The declaration or oath which was filed was determined to be defective. A new original Combined Declaration and Power of Attorney is attached.

PATENT  
ATTORNEY DOCKET NO.: 041501-5437

3. English Translation of Non-English Language Papers

- ☐ Submitted herewith is a verified English translation of the non-English language application papers as originally filed. It is requested that this translation be used as the copy for examination purposes in the PTO.

Also enclosed is the Verification of Translation Document

4. Small Entity Status

- ☐ Small entity status under 37 C.F.R. § 1.27 is asserted for the present application.

5. Fee Calculation

			Basic Fee:	740.00
			Patent Application-\$740.00	
			Design Application-\$330.00	
	Number Filed	Number Extra	at a Rate of	
Total Claims	20 - 20 =		\$ 18.00 each=	
Independent Claims	2 - 3 =		\$ 84.00 each=	
Multiple dependent claim(s), if any			\$280.00	
Missing Parts Surcharge Fee			\$130.00	130.00
<b>SUB-TOTAL =</b>				<b>870.00</b>
<b>Reduction by 1/2 for filing by a small entity</b>				
<b>SUB-TOTAL =</b>				<b>870.00</b>
Fee For Application Filed With A Non-English Specification (37 C.F.R. § 1.17(k) and § 1.52(d))			\$130.00	
Fee For Processing and retention of application (37 C.F.R. § 1.21(l) and § 1.53(d))			\$130.00	
<b>TOTAL FILING FEE =</b>				<b>\$870.00</b>

6. Extension of Time

The proceedings herein are for a patent application and the provisions of 37 C.F.R. § 1.136(a) apply.

- ☐ Applicant petitions for an extension of time, the fees for which are set out in 37 C.F.R. §§ 1.17(a)-(d), for the total number of months checked below:

Total months requested	Fee for extension	[fee for Small Entity]
<input type="checkbox"/> one month	\$ 110.00	\$ 55.00
<input type="checkbox"/> two months	\$ 400.00	\$200.00
<input type="checkbox"/> three months	\$ 920.00	\$460.00
<input type="checkbox"/> four months	\$1,440.00	\$720.00
<input type="checkbox"/> five months	\$1,960.00	\$980.00

Extension of time fee due with this request: \$

If an additional extension of time is required, please consider this a Petition therefor.

- ☒ Applicant believes that no extension of time is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

7. Fee Payment

The total fee due is: Completion Fees \$870.00  
Extension Fees \$

Total Fee Due \$870.00

- ☒ Enclosed is a check in the amount of \$910.00 representing the total fee due and the assignment recordation fee.
- ☒ **Except** for issue fees payable under 37 C.F.R. §1.18, the Commissioner is hereby authorized by this paper to charge any additional fees during the entire pendency of this application including fees due under 37 C.F.R. §1.16 and §1.17 which may be required, or credit any overpayment to Deposit Account No. 50-0310.

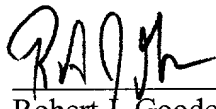
PATENT  
ATTORNEY DOCKET NO.: 041501-5437

8. Additional papers enclosed.

- ☒ Substitute Specification
- ☐ Preliminary Amendment
- ☐ Information Disclosure Statement
- ☐ Form PTO-1449, \_\_\_ reference(s) as listed
- ☐ Citations
- ☐ Declaration of Biological Deposit
- ☐ Submission of "Sequence Listing", computer readable copy and/or amendment pertaining thereto for biotechnology invention containing nucleotide and/or amino acid sequence.

Respectfully submitted,

**MORGAN, LEWIS & BOCKIUS LLP**

  
\_\_\_\_\_  
Robert J. Goodell  
Reg. No. 41,040

Date: October 18, 2001

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0994903-101001  
UNITED STATES PATENT APPLICATION

OF

HONG BAE PARK

FOR

FLAT LUMINESCENT LAMP AND

METHOD FOR MANUFACTURING THE SAME

[0001] The present invention claims the benefit of Korean Patent Application No. P 2000-83097 filed in Korea on December 27, 2000, which is hereby incorporated by reference.

## **BACKGROUND OF THE INVENTION**

### **Field of the Invention**

[0002] The present invention relates to a luminescent lamp, and more particularly, to a flat luminescent lamp and a method for manufacturing the same.

### **Discussion of the Related Art**

[0003] Ultra thin flat panel display devices, especially liquid crystal display (LCD) devices, are widely used in monitors for notebook computers, spacecrafts, and aircrafts.

[0004] A passive luminescence LCD device usually includes a back light provided at the rear of a liquid crystal panel and used as a light source. The back light is inefficient because it increases the weight, power consumption, and thickness of the device.

[0005] The back light used as a light source of an LCD is formed in such a manner that a cylindrical fluorescent lamp is often used. There are two types of back light: a direct type and a light-guiding plate type.

[0006] In the direct type back light, a fluorescent lamp is mounted on a flat panel. To avoid having the shape of the fluorescent lamp displayed on a liquid crystal panel, it is necessary to maintain the distance between the fluorescent lamp and the liquid crystal panel and arrange a light-scattering means to achieve a uniform light distribution. As a result, it is difficult to form a LCD back light with a very thin size.

[0007] As the panel size gets larger, a light-emitting area of the back light increases. If the direct type back light has to cover a large area, the light-scattering means has to have a sufficient thickness to make the light-emitting area flat. This also makes it difficult to form a thin sized



back light for LCD devices.

[0008] For the light-guiding plate type back light, a fluorescent lamp is mounted outside a flat panel so that light is dispersed in all sides using a light-guiding plate. In this case, since the fluorescent lamp is mounted at one side and light passes through the light-guiding plate, luminance becomes too low. Also, for uniform distribution of luminous intensity, advanced optical design and processing technologies are required.

[0009] Currently, to achieve high luminance, a direct type back light has been proposed in which a number of lamps are arranged below a display surface. Alternatively, a lamp with a bent shape is proposed. Recently, a flat luminescent back light with a flat surface facing a display surface of a panel is being researched and developed. This flat luminescent back light is disclosed in US Patent No. 6,034,470.

[0010] A related art flat luminescent lamp will be described with reference to the accompanying drawings.

[0011] Fig. 1 is a plane view illustrating a related art flat luminescent lamp, and Fig. 2 is a sectional view taken along line I-I' of Fig. 1.

[0012] As shown in Figs. 1 and 2, the related art flat luminescent lamp includes a lower substrate 11, an upper substrate 11a, cathodes 13 formed on the lower substrate 11, anodes 13a formed on the upper substrate 11a, four frames 19a, 19b, 19c, and 19d for sealing the lower and upper substrates 11a and 11 by a glass solder, and a plurality of support rods 21 formed between the lower and upper substrates 11 and 11a.

[0013] The anodes 13a are formed in pairs at constant intervals. The cathodes 13 are formed on the corresponding lower substrate 11 between the anodes 13a. The cathodes 13 and the anodes 13a are coated with a dielectric material, and an external voltage is applied to the cathodes 13 and the anodes 13a through a lead line.

[0014] A surface of the upper and lower substrates 11a and 11 facing a discharge space is coated

with a fluorescent material. In the discharge space, a Xe gas induces discharge, forms plasma and emits ultraviolet rays (UV). The emitted UV comes into collision with the fluorescent material formed on the upper and lower substrates 11a and 11. For this reason, the UV is excited to generate visible rays.

[0015] Additionally, a reflecting plate 14 is further provided on the lower substrate 11. The reflecting plate 14 serves to prevent the visible rays generated in the discharge space from leaking out to the rear of the lower substrate 11. The support rods 21 are made of a glass material so as not to interrupt emission of the visible rays.

[0016] Meanwhile, referring to Fig. 2, the cathodes 13 are formed on the lower substrate 11 of glass material, and a first dielectric material layer 12 is formed on the lower substrate 11 including the cathodes 13. The reflecting plate 14 is formed on the first dielectric material layer 12 and a first phosphor layer 15 is formed on the reflecting plate 14. The anodes 13a that induce discharge together with the cathodes 13 are formed on the upper substrate 11a of glass material. A second dielectric material layer 12a is formed on the upper substrate 11a including the anodes 13a. A second phosphor layer 15a is formed on the second dielectric material layer 12a. On the upper and lower substrates 11a and 11, frames 19a, 19b, 19c, and 19d are formed to seal the upper and lower substrates 11a and 11 by a glass solder.

[0017] The cathodes 13 and the anodes 13a are formed by a silk printing or vapor deposition process.

[0018] In the aforementioned related art flat luminescent lamp, if the voltage is applied to the cathodes 13 and the anodes 13a through the lead line, the Xe gas forms plasma in the discharge space between the cathodes 13 and the anodes 13a and emits UV. At this time, the UV comes into collision with the first and second phosphor layers 15 and 15a to generate visible rays.

[0019] However, the related art flat luminescent lamp has several problems. Since four frames and a number of the support rods are required to seal the lower and upper substrates, the number of parts for manufacturing the lamp increases and the process steps become complicated. This also leads to the increased weight and volume of the lamp.

### SUMMARY OF THE INVENTION

[0020] Accordingly, the present invention is directed to a flat luminescent lamp and a method for manufacturing the same that substantially obviate one or more of the problems due to limitations and disadvantages of the related art.

[0021] An object of the present invention is to provide a flat luminescent lamp and a method for manufacturing the same, in which the number of parts is minimized to minimize the process steps, thereby reducing the manufacturing cost.

[0022] Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0023] To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a flat luminescent lamp according to the present invention includes first and second substrates attached to each other at a plurality of adhesive portions, a plurality of discharge spaces extended in a stripe shape in regions other than the adhesive portions, first and second electrodes arranged in the discharge spaces to be separated from each other, first and second phosphor layers formed in the discharge spaces including the first and second electrodes, and first and second frames sealing the first and second substrates.

[0024] To further achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a method for manufacturing a flat luminescent lamp according to the present invention includes the steps of forming a plurality of stripe shaped grooves in first and second substrates, forming first and second electrodes on the first and second substrates in the grooves, forming a reflecting material layer on the first substrate in the grooves including the first electrode, forming first and second phosphor layers in the grooves including the reflecting material layer and the second electrode, attaching the first and second substrates to each other so that the grooves face each other, and sealing the first and second substrates after injecting a phosphor gas into the grooves.

[0025] In the preferred embodiment of the present invention, the grooves are respectively formed in the first and second substrates (lower and upper substrates), and the first and second substrates are attached to each other so that the grooves formed in the first substrate face the grooves formed in the second substrate. Before the first and second substrates are attached to each other, the first electrode which will be a cathode is formed in the groove of the first substrate and a first dielectric layer is formed in the grooves including the first electrode. A reflecting material layer is formed on the first dielectric layer and the first phosphor layer is formed on the reflecting material layer.

[0026] The second electrode which will be an anode is formed in the groove of the second substrate and a second dielectric layer is formed in the grooves including the second electrode. The second phosphor layer is formed on the second dielectric layer.

[0027] If the first and second substrates provided with the electrodes and the phosphor layers in the grooves are attached to each other to face each other, the grooves formed in the first substrate and the grooves formed in the second substrate form certain spaces that serve as discharge spaces.

[0028] It is to be understood that both the foregoing general description and the following

detailed description are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0029] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and together with the description serve to explain the principles of the invention. In the drawings:

[0030] Fig. 1 is a plane view illustrating a related art flat luminescent lamp;

[0031] Fig. 2 is a sectional view taken along line I-I' of Fig. 1;

[0032] Fig. 3 is a plane view illustrating a flat luminescent lamp according to the present invention;

[0033] Fig. 4 is a sectional view taken along line I-I' of Fig. 3;

[0034] Fig. 5 is a sectional view taken along line II-II' of Fig. 3;

[0035] Fig. 6 is a sectional view taken along line III-III' of Fig. 3;

[0036] Figs. 7A to 7C show discharge spaces according to a flat luminescent lamp of the present invention; and

[0037] Figs. 8A to 8E are sectional views illustrating process steps of manufacturing a flat luminescent lamp according to the present invention, in which Figs. 8A and 8E are sectional views taken along line III-III' of Fig. 3 and Figs. 8B to 8D are sectional views taken along line II-II' of Fig. 3.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0038] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

[0039] Fig. 3 is a plane view illustrating a flat luminescent lamp according to the present invention, Fig. 4 is a sectional view taken along line I-I' of Fig. 3, and Fig. 5 is a sectional view taken along line II-II' of Fig. 3.

[0040] As shown in Figs. 3 to 5, the flat luminescent lamp according to the present invention includes first and second substrates 31 and 31a attached to each other to face each other, each having a plurality of grooves on an attached surface. First and second electrodes 33 and 33a are arranged in the grooves to be separated from each other in the up and down direction. First and second phosphor layers 37 and 37a are formed in the grooves including the first and second electrodes 33 and 33a. First and second frames 39 and 39a are used for sealing the first and second substrates 31 and 31a.

[0041] The first and second substrates 31 and 31a are typically formed of a glass material. However, the first substrate 31 may be formed of a ceramic material.

[0042] The grooves have a stripe shape and are used as discharge spaces that emit white light by discharge between the first and second electrodes 33 and 33a. Both ends of each groove are connected with both ends of a neighboring groove so that a light-emitting area is maximized.

[0043] The grooves are formed in vertical direction relative to the substrates while the first and second frames 39 and 39a are formed in horizontal direction relative to the substrates.

[0044] Areas marked by dotted lines in Fig. 3 represent attached surfaces between the first and second substrates 31 and 31a.

[0045] As shown in Fig. 4, a reflecting material layer 35 is further provided on the first substrate 31. The reflecting material layer 35 serves to direct and concentrate the white light generated by discharge between the first and second electrodes 33 and 33a toward the second substrate 31a so that it does not leak out to the first substrate 31.

[0046] A dielectric layer (not shown) may further be provided on an entire surface including the first and second electrodes 33 and 33a. In such a case, the reflecting material layer 35 is formed

on the dielectric layer.

[0047] The first electrode 33 is a cathode while the second electrode 33a is an anode. Preferably, the second electrode 33a is formed of a transparent conductive material such as indium tin oxide (ITO). The second electrodes 33a may also be formed of other transparent or non-transparent conductive material. If the second electrode 33a is formed of non-transparent material, a diffusion sheet is further provided on the second substrate 31a so that the white light is uniformly emitted along an entire region of the light-emitting surface.

[0048] Meanwhile, the discharge spaces are formed in a stripe shape, and both ends of each discharge space are connected with both ends of a neighboring discharge space.

[0049] The grooves which will be discharge spaces, as shown in Fig. 6, are formed in such a manner that both ends of each groove are connected with both ends of a neighboring groove to maximize a discharge space.

[0050] It is desirable that the grooves are formed in a shape that induces discharge. For example, if the grooves have a rectangular shape, the discharge efficiency at four corners may deteriorate. Accordingly, the grooves are preferably formed in a round shape as shown in Fig. 7A or a shape with a plurality of surfaces (e.g., a polygon shape) close to the round shape as shown in Fig. 7B so that the distance between a light-emitting central portion of the discharge space and the phosphor layer is uniformly maintained.

[0051] Furthermore, the first and second substrates 31 and 31a are attached to each other at a very small area so that brightness of light is maximized.

[0052] In Fig. 3, the second electrode 33a is formed of separate singular electrodes. However, as shown in Figs. 7A-7C, depending on electrode design, two electrodes in pairs may be formed or three electrodes or more in one group may be formed.

[0053] The operation of the aforementioned flat luminescent lamp according to the present invention is similar to the operation of the related art flat luminescent lamp. That is, if a voltage

is applied to the first and second electrodes 33 and 33a after an external power source is respectively connected with them, Xe gas forms plasma and emits UV between the first and second electrodes 33 and 33a. The UV comes into collision with the first and second phosphor layers 37 and 37a to generate white light. The white light is emitted to the second substrate 31a without being leaked out to the first substrate 31 by the reflecting material layer 35 formed in the first substrate 31.

[0054] If the aforementioned flat luminescent lamp is used as a back light of an LCD device, an LCD panel is arranged at the rear of the second substrate 31a.

[0055] A method for manufacturing the flat luminescent lamp according to the present invention will now be described with reference to Figs. 8A to 8E. Figs. 8A and 8E are sectional views taken along line III-III' of Fig. 3, and Figs. 8B to 8D are sectional views taken along line II-II' of Fig. 3.

[0056] As shown in Fig. 8A, a plurality of grooves 32 are formed in the first and second substrates 31 and 31a. Fig. 8B shows an enlarged inner portion of the grooves. Using silk printing, vapor deposition process, or photolithography process, the first electrode 33 (i.e., the cathode) is formed on the first substrate 31 while the second electrode 33a (i.e., the anode) is formed on the second substrate 31a.

[0057] At this time, the grooves may be formed by molding or etching the first and second substrates 31 and 31a. The second electrode 33a is formed of a transparent conductive material such as ITO so that the white light is emitted by passing through the transparent second electrode 33a.

[0058] Additionally, the first and second electrodes 33 and 33a may be formed of a metal having low specific resistance, such as Ag, Cr, Pt, and Cu.

[0059] Afterwards, as shown in Fig. 8C, the first dielectric layer 34 is formed on the first substrate 31 including the first electrode 33 while the second dielectric layer 34a is formed on



the second substrate 31a including the second electrode 33a.

[0060] Subsequently, as shown in Fig. 8D, the reflecting material layer 35 of AlN, BaTiO<sub>3</sub>, SiN<sub>x</sub>, or SiO<sub>x</sub> is formed on the first dielectric layer 34. The reflecting material layer 35 is formed to direct and concentrate the white light generated by collision between the UV and the phosphor layers toward the second substrate 31a so that the white light does not leak out to the first substrate 31.

[0061] The first and second phosphor layers 37 and 37a are formed on the reflecting material layer 35 and the second dielectric layer 34a. The first and second substrate 31 and 31a are then attached to each other, as shown in Fig. 8E. A phosphor gas, such as Xe gas, is injected between them through a gas injection hole (not shown), and the substrates 31 and 31a are sealed through first and second frames (not shown) using a solder means such as a glass solder. Thus, the process for manufacturing the flat luminescent lamp according to the present invention is completed.

[0062] The flat luminescent lamp according to the present invention can be used as a lighting device and can also be used as a separate light source at the rear or front of display devices such as monitors, notebook PCs, and TVs.

[0063] As described above, the flat luminescent lamp and the method for manufacturing the same according to the present invention have the following advantages.

[0064] Since only two frames are required and no separate support rod is formed between the first and second substrates, the number of parts required for making the lamp can be minimized, thereby saving the manufacturing cost. Furthermore, since no separate support rod is formed and the first and second substrates are directly attached to each other, it is possible to achieve strong support and improve durability of the product. Moreover, since the grooves are formed in the substrate and used as discharge spaces, the thickness and weight of the product can be minimized.

[0065] The foregoing embodiments are merely exemplary and are not to be construed as limiting the present invention. The present teachings can be readily applied to other types of apparatuses. The description of the present invention is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art.

102T01" E0646360

**What is claimed is:**

1. A flat luminescent lamp comprising:  
first and second substrates attached to each other at a plurality of adhesive portions;  
a plurality of discharge spaces in regions other than the plurality of adhesive portions between the first and second substrates;  
first and second electrodes arranged in the discharge spaces to be separated from each other;  
first and second phosphor layers formed in the discharge spaces; and  
first and second frames sealing the first and second substrates.
2. The flat luminescent lamp of claim 1, further comprising a reflecting material layer formed in the discharge spaces adjoining the first substrate.
3. The flat luminescent lamp of claim 1, wherein the plurality of discharge spaces are formed along a vertical direction of the first and second substrates.
4. The flat luminescent lamp of claim 1, wherein the first and second frames are formed along a horizontal direction of the first and second substrates.
5. The flat luminescent lamp of claim 1, wherein the first electrode includes a transparent conductive material.
6. The flat luminescent lamp of claim 5, wherein the transparent conductive material includes indium tin oxide.

7. The flat luminescent lamp of claim 1, further comprising a first dielectric layer formed in the discharge spaces adjoining the first substrate and a second dielectric layer formed in the discharge spaces adjoining the second substrate.

8. The flat luminescent lamp of claim 1, wherein the plurality of discharge spaces each have a round shape or a polygon shape close to a round shape.

9. The flat luminescent lamp of claim 1, wherein the first and second substrates each comprise a glass material.

10. The flat luminescent lamp of claim 1, wherein the first substrate comprises a ceramic material while the second substrate comprises a glass material.

11. The flat luminescent lamp of claim 1, wherein the first and second electrodes are formed along the discharge spaces.

12. The flat luminescent lamp of claim 1, wherein the plurality of discharge spaces have a stripe shape.

13. The flat luminescent lamp of claim 1, wherein the plurality of discharge spaces are spaced apart from each other.

14. The flat luminescent lamp of claim 1, wherein the first electrode includes two or more separate electrodes.

15. The flat luminescent lamp of claim 1, wherein the first frame is attached to the second substrate along one side of the first substrate while the second frame is attached to the first substrate along a side of the second substrate that is not attached to the first frame.

16. The flat luminescent lamp of claim 1, further comprising a diffusion sheet formed at a rear side of the second substrate.

17. A method for manufacturing a flat luminescent lamp comprising the steps of:  
forming a plurality of stripe shaped grooves in first and second substrates;  
forming first and second electrodes on the first and second substrates in the grooves;  
forming a reflecting material layer on the first substrate including the first electrode in the grooves;  
forming phosphor layers on the reflecting material layer and the second electrode in the grooves;  
attaching the first and second substrates to each other so that the grooves face each other;  
and  
sealing the first and second substrate after injecting a phosphor gas into the grooves.

18. The method of claim 17, further comprising the step of forming a dielectric layer after forming the first and second electrodes.

19. The method of claim 17, wherein the grooves are formed so that both ends of neighboring grooves are connected with each other.

20. The method of claim 17, wherein the step of sealing the first and second substrates includes the step of soldering the first and second frames.

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### ABSTRACT OF THE DISCLOSURE

A flat luminescent lamp includes first and second substrates attached to each other at a plurality of adhesive portions, a plurality of discharge spaces in regions other than the plurality of adhesive portions between the first and second substrates, first and second electrodes arranged in the discharge spaces to be separated from each other, first and second phosphor layers formed in the discharge spaces, and first and second frames sealing the first and second substrates.

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COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY  
U.S. DEPARTMENT OF COMMERCE  
Patent and Trademark Office

ATTORNEY DOCKET NO.: 041501-5437

As a below named inventor, I hereby declare that

**FLAT LUMINESCENT LAMP AND METHOD FOR MANUFACTURING THE SAME**

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

the specification of which.

is attached hereto, or

was filed as United States application Serial No. \_\_\_\_\_ on \_\_\_\_\_ and was amended on \_\_\_\_\_ (if applicable); or

was filed as PCT international application Number \_\_\_\_\_ on \_\_\_\_\_ and was amended under PCT Article 19  
On \_\_\_\_\_ (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the U.S. Patent and Trademark Office information which is material to the patentability of claims presented in this application in accordance with Title 37, Code of Federal Regulations Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate or Section 365(a) of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign applications(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed.

PRIOR FOREIGN APPLICATION(S):

COUNTRY (if PCT, indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED
Korea	2000-83097	27 December 2000	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No
			<input type="checkbox"/> Yes <input type="checkbox"/> No



Combined Declaration for Patent Application and Power of Attorney - (Continued)  
(includes Reference to PCT International Applications)  
ATTORNEY DOCKET NO.: 041501-5437

I hereby claim the benefits under Title 35, United States Code Section 119(e) of any United States provisional application(s) listed below.

U.S. PROVISIONAL APPLICATIONS

U.S. PROVISIONAL APPLICATION NO.

U.S. FILING DATE:

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) or Section 365(c) of any PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose to the U S Patent and Trademark Office all information known to me to be material to the patentability of claims presented in this application in accordance with Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application(s) and the national or PCT international filing date of this application

PRIOR U.S. APPLICATIONS OR PCT INTERNATIONAL APPLICATIONS DESIGNATING THE U.S FOR BENEFIT:

U.S. APPLICATIONS		STATUS (Check One)		
U.S. APPLICATION NO.	U.S. FILING DATE	PATENTED	PENDING	ABANDONED

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the registered practitioners of Morgan, Lewis & Bockius LLP included in the Customer Number provided below to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and direct that all correspondence be addressed to that Customer Number.

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**202-467-7000**

Combined Declaration for Patent Application and Power of Attorney - (Continued)  
 (includes Reference to PCT International Applications)  
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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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DATE *18. July. 2001*

Listing of Inventors Continued on attached page(s): ☐ Yes ☒ No